Poster III-27

Modeling Tuberculosis Granuloma Formation in the Lung

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Infection with Mycobacterium tuberculosis a major world health problem. There are estimates of 2 billion people presently infected and 3 million deaths per year. Once these bacteria are inhaled into the lung, a complex immune response is triggered leading to the formation of unique immunological structures termed granulomas that either contain bacteria resulting in a latent infection or are unable to control bacterial growth and lead to active disease. Thus, understanding granuloma formation and function is key for improving both diagnostics and treatment. There are several factors involved in granuloma formation. Specific immune cells, such as macrophages, CD4 and CD8 T cells, as well as immune effectors, such as chemokines and cytokines must interact in complex ways to allow for granuloma formation. To study this dynamical system we develop an agent based virtual model of granuloma formation in the lung. This model combines continuous representations of chemokine diffusion with discrete representations of macrophages and T cells in a cellular automata-like environment. We are exploring several spatial aspects of granuloma formation to understand the dynamics and predict different disease outcomes.

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